Scope: The Contractor shall provide, in accordance with the terms, conditions, and provisions of this contract, Test Program Sets for the following circuit card assemblies (listed top down in order of priority):

5930-01-300-8303,ARMS,120024-0001 --------]____   **Build one fixture which**
5998-01-311-9874,ARMS,119982-0001 --------]   **will test these 2 cards**

5998-01-311-9869,ARMS,19966-0001
5895-01-363-2022, MARK20 ,120300-0001
5998-01-363-2043, MARK 20, 120289-0001
5998-01-311-9872,ARMS,119983-0001
5998-01-162-6641, 2GVORTAC, 2800076G001
5998-01-311-9870,ARMS,19972-0001

5998-01-383-0061, MARK 20, 120291-0002 --------]____   Build one fixture which
5998-01-383-0068, MARK 20, 120286-0001 --------]   will test these 2 cards

5998-01-083-4333, DME9639, 103135   ----------]____   **Build one fixture which**
5998-01-147-2481, DME9783, 103663   ----------]   **will test these 2 cards**

5998-01-300-8311,ARMS,120001-0001
5998-01-050-9438, ASR8, 821813-1
5998-01-299-5829, ASR8, 821520-1
5998-01-393-0331, VOR DME, 120225-0001
5998-01-311-9873,ARMS,119988-0001
5998-01-299-6573,ARMS,119970-0001
5998-01-051-6618, ASR8, 821765-1
5998-01-472-8142, ALSF2NBP, U3001063
5998-01-051-6617, ASR8, 821762-1
5998-01-050-9431, ASR8, 821768-1

5998-01-082-8375, DME9639, 103134 ----------]____   **Build one fixture which**
5998-01-146-6950, DME9783, 103642 ----------]   **will test these 2 cards**

5998-01-490-3292, ALSF2NBP, 93001085
5998-01-473-2157, ALSF2NBP, U3001074
5998-01-394-2540, VOR DME, 120228-0001
5998-01-160-0246, 2GVORTAC, 119436-0001   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-227-8535, 2GVORTAC, 2800082G001   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-220-6974, 2GVORTAC, 119588-0001   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-394-2536, VOR DME, 120229-0002   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-363-2031, MARK 20, 120307-0001   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-214-2550, 2GVORTAC, 119442-0001   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-394-2542, VOR DME, 120217-0001   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-394-2543, VOR DME, 120219-0003   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-076-5437, ARTS2E, 2670-1946   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-394-2539, VOR DME, 120216-0001   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-472-8139, ALSF2NBP, U3001060   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-472-7339, ALSF2NBP, U3001055   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-408-9469, PAPI, 3001001-01   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-408-7555, PAPI, 3001004-01   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-363-2037, MARK 20, 120312-0001   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**
5998-01-473-2079, ALSF2NBP, U3001072   **TEST FIXTURE ALREADY BUILT FOR THIS CARD**

Please note that .ckt files will be provided for **ALL** of the circuit cards listed above. Test fixtures have been built for **16** of the cards. This should reduce the cost of developing test programs.

The test package for each circuit card, shall consist of an application software program, documentation packages, and CCA interface fixture (**for those cards with fixtures not already built**) to be used on a Government-owned **Teradyne TEST STATION 8X**. All deliverables will become the exclusive property of the Government. The Government will have unlimited rights to reproduce, copy, modify, use, and distribute all information and/or hardware and/or software produced as a result of this contract.

ATE Test Program Set General Requirements: Design, develop, test, debug, and deliver a Test Program Set (TPS), consisting of software, hardware, and documentation.

Objective: The objective of the FAA is to obtain test software and hardware such that an operator using the application software test program with appropriate fixture and complete operator prompting instructions shall be capable of isolating faults to a confidence factor of 99% or greater. If the Contractor determines that this confidence factor can not be met or that the achievement of this confidence factor can not be done in a cost-effective manner, he shall provide a detailed explanation to the Contracting Officers technical representative (COTR), requesting approval to deviate. The request to deviate shall include a detailed explanation of why the requested confidence factor cannot be met. The Contractor shall use an automated fault isolation process using an in-circuit test process to the maximum extent possible.

Circuit Card Assembly Digitizing:
No CAD data is available for these circuit card assemblies. The CCA shall be digitized in order to obtain the fixture drill data. All component holes shall be digitized even if a component is not physically located on the CCA. All components located on the CCA cannot be removed for the digitizing process. The contractor is responsible for any damage to the CCA during this process. All data obtained from the digitizing process shall be provided on magnetic media.

Test Software Development: Every component on the CCA shall be tested in accordance with the test procedures applicable to the TEST STATION 8X. Speed plus tests shall be used if available for that component. **A custom test vector model shall be supplied** for any component whose test program is not available in the standard GENRAD test libraries. **No boundary scan tests will be allowed.** All Programmable logic devices (PLDS) shall have tests written

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manually or can be automatically generated by third party software such as FLYNN SYSTEMS ATG or ACCUGEN ATG. If tests for PLDS are written manually the contractor shall provide a document describing the custom test as described below in the Software Documentation section of this contract. **If any components cannot be tested, or a component cannot be tested to its fullest extent, a detailed written justification shall be provided to the COTR for approval.** The objective is to provide fault isolation to the component level with a minimum requirement for operator intervention. When operator intervention is required, the test software shall prompt the operator with the complete set of instructions needed.

Teradyne Tester Configuration: The contractor shall target the Test Program Set to run on the government owned TERADYNE Test Station 86. Please reference the following tester configuration, which was generated by a hardware report command on the FAA owned tester:

```
Government owned TERADYNE Test Station 86 configuration
---------------------------------------------------------
TARGET                 2286
SYS_TYPE               2286SYS
SYS_PIN_SLOTS          30
SYS_ACCESSORY_SLOTS  0
SYS_NAME               TS86
CPU_TYPE               PC
OS_TYPE                XP
8X_SW_VERSION          R_5_8_0
RECEIVER_TYPE          BED_OF_NAILS
PINS
      COMBO1      1-27 (max nail = 3456)
DIG_CONTROL
      HSC         1      SLOT 1
      REF_PIO     1      SLOT 3
      DSM         1      SLOT 32    MEMORY      8MB
CST
      CST20       1      SLOT 2
POWER
      PS      1    VOLTAGE    20.00      CURRENT    8.00 SLOT 2
      PS      2    VOLTAGE    20.00      CURRENT    8.00 SLOT 3
      PS      3    VOLTAGE    20.00      CURRENT    8.00 SLOT 4
      PS      4    VOLTAGE    20.00      CURRENT    8.00 SLOT 5
      PS      5    VOLTAGE    20.00      CURRENT    8.00 SLOT 6
      PS      6    VOLTAGE    20.00      CURRENT    8.00 SLOT 7
      PS      7    VOLTAGE    7.00 CURRENT    15.00      SLOT 1
ANALOG
      ICA         1
      HV_SRC          1
FUNCTIONAL
      AFTM        1      SLOT 33
IEEE
```

```
     IEEE_NI          1
MISC
     MTG         1    SLOT 0
```

Documentation: A document shall be provided that includes technical instructions, procedures, and guidelines for the maintenance and/or modification of custom component tests/models or non-standard tests.

This section shall provide a complete detailed description of source code written for custom models, tests written manually for PLDS, and tests **not** included in the standard board test libraries. A complete description of source code shall also be given for models that are a part of the standard board test libraries but have been modified extensively.

This source code description shall contain all software modules and/or subroutines inclusive of I/O parameters, data passed, function or purpose, syntax, external calls, linkages used, pertinent system parameters and formats, status bit assignments, and key flags and controls.

Provide a flow chart for all custom models and tests not included in the standard board test libraries. Any software used for custom models/non-standard tests shall be provided and will include a description on its use for that component test. This document shall also contain an assembly drawing and Bill of Materials for the test fixture with sources for every fixture component. The source list shall contain all source addresses and phone numbers. Both a hard copy, and a magnetic media copy of the documentation shall be provided.

Test Station 8X Fixture: The contractor shall be responsible for the design and manufacture of the TEST STATION 8X If a test fixture has already been manufactured for the particular CCA in question, the contractor shall be responsible for any wire modifications or corrections test fixture used to test the CCA. necessary. The following paragraphs describe the technical requirements for the TEST STATION 8X test fixture.

Fixtures accommodating more than one circuit card type: To avoid excess cost, some fixtures will be built to handle two different circuit cards. Please see the notes next to the "circuit card assembly list" in the "scope" section of this statement of work.

Spare Parts: In addition to manufacture of the fixture, **spares shall be provided for each type of probe and probe socket** used on the fixture. The number of each type of spare probe and sockets provided shall be 25% of the total number of that type of probe/socket used in the manufacture of the fixture. Each different probe and socket type shall be delivered in a clearly marked container listing part number, and supply source.

Probe Sockets: Only replaceable wire wrap style probes sockets shall be used. The probe Tip Style is to be determined by the vendor to insure best contact at the particular location to be probed.

Probe Hole Drilling: To allow for future addition of probes, the fixture vendor shall drill one hole for every hole on the board to be tested. **Probes shall be installed at all utilized board edge connector locations. This will allow continuity testing to these points.** Probes shall be installed and wired into each hole location only as shown on the Test Fixture Assembly Drawing. All extra holes shall be ready to accept additional probe shells and shall be sealed to prevent vacuum leaks. All drill data shall be supplied on magnetic media in ASCII compatible format. Drill data shall include everything required to reprocure a duplicate fixture.

Ground Plane: A tin-plated copper Ground Plane shall be mounted to the under side of the fixture vacuum head so as to allow short connections between the ground plane and any test probe necessary. The Ground Plane shall be drilled for each hole on the board being tested to allow for future addition of probes.

At least one ground nail per IC shall be provided. Additional ground nails may be used.

Auxiliary Circuitry: If auxiliary circuitry is to be used with the test fixture, a description of the auxiliary circuit shall be provided to the COTR for approval. The contractor shall supply all parts, schematics, assembly drawings, functional descriptions and wiring information for auxiliary circuitry. It is suggested that these be mounted on a panel and fastened to the inside of the fixture. However, the exact mounting location and techniques are left up to the discretion of the supplier as long as the parts are easily accessible for troubleshooting purposes without any disassembly of the main fixture body. All parts shall be suitably mounted to protect them from damage and accidental unplugging due to rough handling during use and storage.

Dust Covers: A clear plastic dust cover shall be provided for the top of the fixture in place of the CCA to cover the probes. A bottom cover shall be provided for covering the gold contact pins.

Shorting Plates: A shorting plate shall be provided along with the appropriate GENRAD generated test software.

Operation: All fixtures shall be vacuum actuated as opposed to manual mechanical actuation.

Fixture Kit Size and Weight: All fixtures shall be made of the lightest material possible while maintaining highest possible strength. Base pans and top/probe plate frames shall be made of aluminum or stainless steel. The recommended technique for mounting the top plate to the probe plate is through the use of locking guide pins, in two or four corners, which work to align the top and probe plates. Install plastic feet to protect the fixture during handling.

CCA mounting/retention: The CCA shall align to the test fixture utilizing either guide pins (when holes in the CCA are available), or pins that "cage" the CCA in the proper location. In either case, the CCA shall not be free to move in any direction on the gasket. A minimum of 2 "guide" pins should accomplish this or a minimum of 4 "cage" pins. One caging pin, per CCA side, is needed achieve a secure fit.

Handles: The fixture shall have at least 3 handles. One handle shall be centered on each side of the fixture. One handle on the front is needed to facilitate fixture removal from its storage shelf. The handles on the sides, used for lifting the fixture, shall be the type designed to work with a fixture lift. In addition, the handles shall allow a person's hand to pass through the handle to allow grasping. The handles must allow a person to close their hand around the handle. (Refer to picture below)
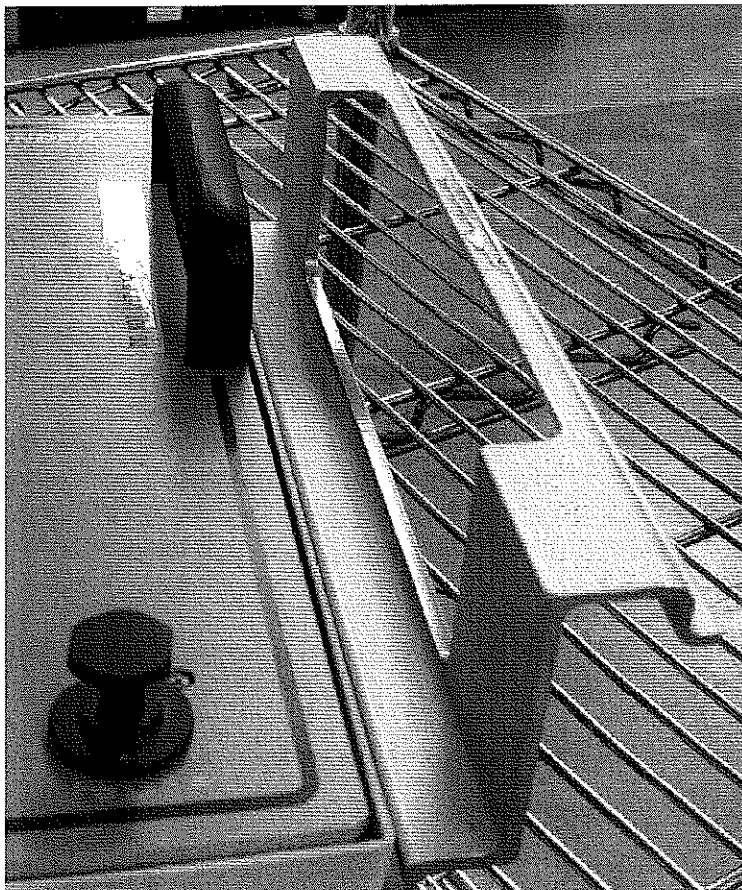
Power Islands: Power Islands shall be the wire-wrap comb type with terminal lug connections.

Wiring: Wiring between the probes and power islands shall be done by wire wrap techniques. Wire wrap wire shall be No. 26 gauge. No blue wire shall be used. (Blue wire is used for modifications to the fixture.) All power and ground wires to the power islands shall be 14 gauge. All probe locations for ground are connected to the ground plane with black wires. All probe locations for VCC are connected to the power island with red wires. Any additional power buss wiring is different in color and is labeled at the power island. For twisted-pair wiring, both ends of the grounding wire are connected to ground.

Ground wires shall be the first wires installed, to guarantee the shortest wire possible, between each ground nail and the ground plate.

All nodes shall be wired as twisted pairs. Route the pair as close to the ground plate as practical. Attach the return wire of the twisted pair to the ground plate at both the nail and interface board ends.

For very fast, high current, or very critical signals, use coaxial cable.

Bottom Fasteners: If screws are used to fasten the bottoms to the fixtures they shall be flat-head type screws and be countersunk flush with or below the surface.

Hardware Safety: User and operator safety shall be of paramount concern in the design and fabrication of the unit. Pinch points and sharp edges shall be avoided. Latches shall hold units securely closed. Cantilever hinge assemblies (see picture below) shall be used and shall have the ability to raise and support the test head but will not allow the unit to spring open abruptly or slam shut. Over clamp devices shall be designed so that the latch does not release until the user activates the release mechanism.
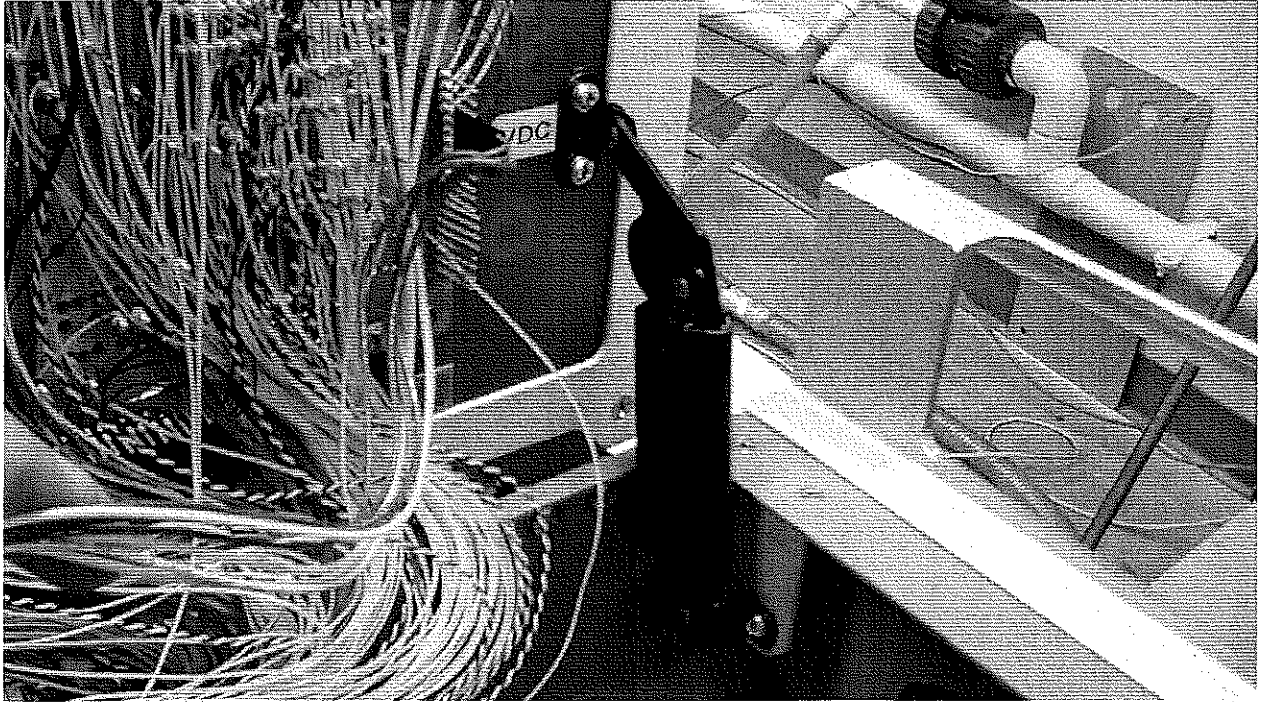
Acceptance Test:
The Contractor shall deliver all test program software source and object files on magnetic media to the FAA for review prior to the acceptance test. Any concerns during this review will be addressed to the contractor, and shall be resolved prior to final acceptance testing.

After the review, the complete Test Program Set(s) shall be delivered to the FAA. The FAA shall then conduct an acceptance test to assure that the test software conforms to specifications. FAA personnel shall conduct the acceptance test at the FAA Logistics Center in Oklahoma City. Corrective actions shall be taken by the contractor, if directed by the CO or his designated representative. At the FAA's request the Contractor shall travel to the FAA Logistics Center to correct Test Program Set problems.

Each TPS shall be tested over several repairable CCAs. The FAA shall have the responsibility and authority to ensure objective testing and to cause the initiation and verification of corrective action. During the acceptance test the FAA may place the Genrad in "Debug" mode to observe any desired component test in more detail.

The FAA may insert faults during testing to ensure that the test program flags inserted faults.

Repairable CCAs Testing: The test program shall be tested over a number of repairable CCAs to see if the program can isolate the faulty components of the CCAs.

Master Software Programs: Master programs shall be delivered on magnetic media for each CCA. The media shall contain all test software source and object files, source code for any custom tests, models or libraries and macro files. For custom tests, each code line or logical group of sequentially executable code lines shall include a brief explanatory comment which will provide enough information for a knowledgeable technician or engineer to follow the process being executed. Macros shall be included as separate files. The magnetic media shall be of high quality. These media shall contain all test module source and object code and system executive code necessary to document the software, reproduce the CCA tests and diagnostics, and functions in the TEST STATION 8X.